

EES Catalysis

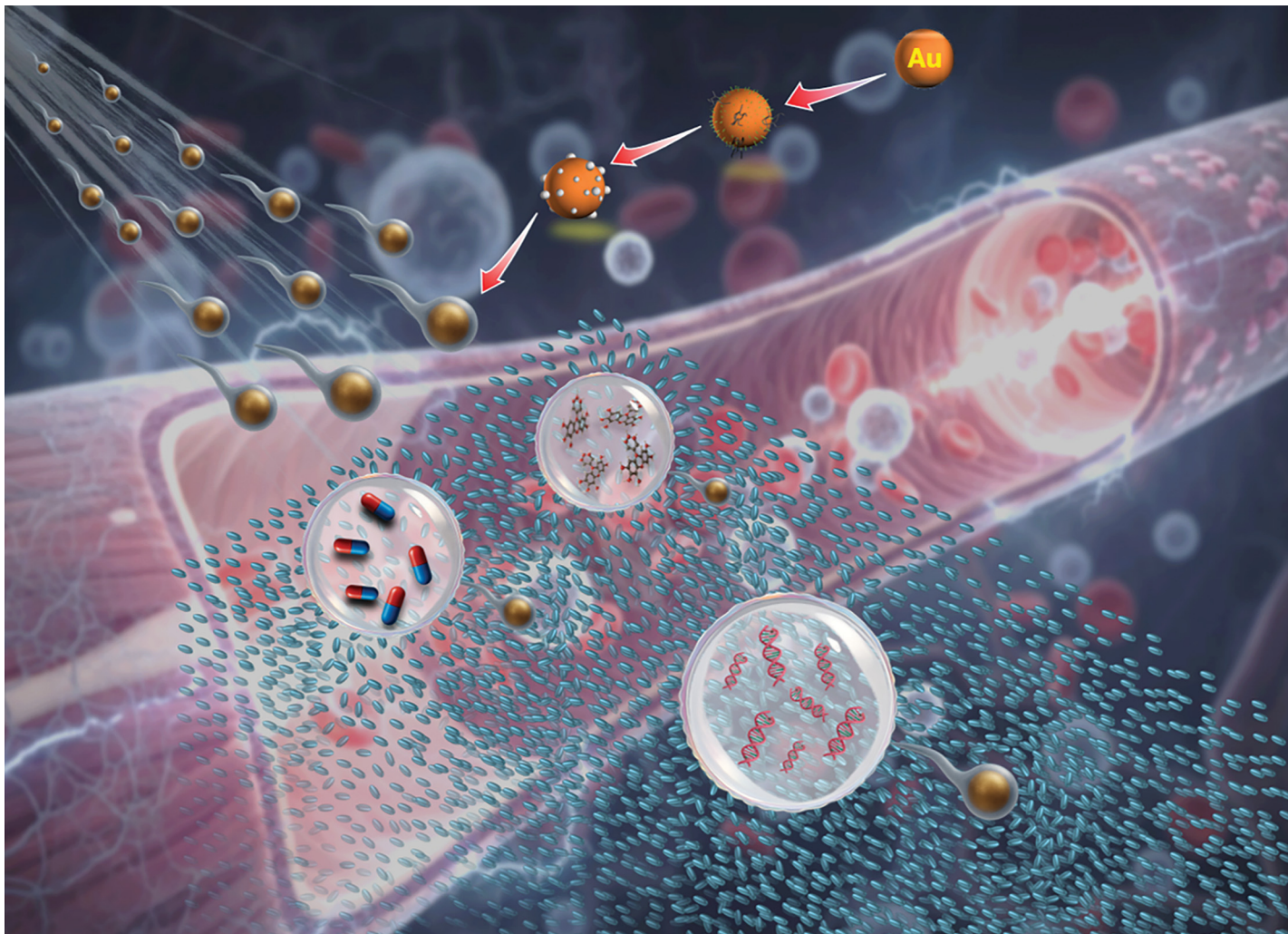
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**Fundamental questions
Elemental answers**



**Showcasing research from Professor Xiao Li's laboratory,
Department of Materials Science & Engineering,
University of North Texas, Denton, USA.**

Asymmetry-driven irregular topological defects and hydrodynamic cavitation of tadpole particles in nematic liquid crystals

Asymmetric tadpole-shaped Janus nanoparticles with gold cores and flexible silica tails were synthesized. The micrometer-sized SiO_2 tails exhibit exceptional flexibility, distorting the surrounding liquid crystal (LC) field into butterfly-shaped topological defects. As these particles moved through the LC medium under capillary forces, dynamic interfacial fluctuations between the air and LC phases facilitated the formation of metastable cavities under a balance among capillary, elastic, and viscous forces. These findings advance fundamental understanding of defect-fluid interactions and offer potential applications in microactuators, adaptive optics and targeted drug delivery.

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As featured in:



See Ying Bao, Xiao Li *et al.*,
Mater. Adv., 2025, **6**, 6711.